REMARKS

Applicants acknowledge the First Action of 27 JUN. 2005 and request reconsideration of the application as amended. Claims 1 and 2 have been combined, and several dependent claims have been amended to provide clearer antecedent basis.

Applicants note, with appreciation, the indication of allowable subject-matter in claims 7-8, 10-11, 16-17 and 19. However, in view of the amendment of main claim 1, rewriting of dependent claims in independent form is not believed necessary.

BACKGROUND

The present invention teaches how to construct an ECM (**E**lectronically **C**ommutated **M**otor) so that one can supply its power in the form of a pulsing DC voltage.

Under (all-too-frequent) conditions of load fluctuations, such a pulsing DC voltage tends to **vary excessively**. FIGS. 7-8 of the present application illustrate a pulsing DC voltage (U_B) during **idling** of a motor. As described at specification page 14, top, the voltage has an effective value of 254 V and a peak-to-peak value of 34 V.

FIGS. 9-10 illustrate the relationships in a motor **under load**. The effective value is 267 V, while the peak-to-peak value has ***doubled*** to 78 V.

Assuming that one controls the motor currents using MOSFETs (Metal Oxide Semiconductor Field Effect Transistors), one must take measures to assure that the potential difference between source electrode S and gate electrode G does not exceed a predetermined value; otherwise, the transistors get **damaged**.

Conventionally, this problem has been handled by smoothing the operating voltage U_B so that only small ripples occur in this voltage. For that, one needs large capacitors, which create another problem, namely that they have only a short service life, and therefore limit the mean-time-to-failure of the motor itself. The mechanical lifetime of the rest of the motor would otherwise

be thousands of operating hours, but large capacitors do not achieve such lifetimes. Further, in modern compact motors, one typically has insufficient space for large capacitors and, *even if* one made such space by making the motor bigger, the large capacitors would create a lot of waste heat, which also tends to degrade the service lifetime of various motor components. Thus, those active in the motor art *constantly strive* to reduce the required size of the capacitors, by various electronic strategies.

The present invention is directed to a clever "electronic trick" which is nowhere suggested by the prior art. For this purpose, one arranges for the control voltage U_{ST}, to be applied to the p-channel MOSFETs, to always follow the pulsing DC voltage at the DC link circuit, so that this control voltage *always remains negative* with respect to the pulsing positive potential on the positive lead (30) of the DC link circuit. This is described on specification page 8, middle paragraph, and page 12, last 3 paragraphs. In FIGS. 8 & 10, one can see that the voltage UST always follows the operating voltage UB and always remains lower than the latter.

FIG. 2 show that this control voltage UST is applied to control the p-channel MOSFETs (the upper MOSFETs) so that these are always driven with a permissible limited voltage difference between source S and gate G.

CLAIM REJECTION-SECTION 103

By contrast, the cited KARWATH structure (assigned to the assignee of the present case) uses, according to FIG. 3, an H-bridge 12 with four N-channel MOSFETs 100, 102, 104, 106. The control of the lower MOSFETs 104, 106, which are coupled to the negative lead 46 of the DC link 52, 46, present no problem. However, the control of the upper MOSFETs 100, 102 is difficult, because one needs a potential which is higher than the potential of +320 V (col. 2, line 29) on the positive lead 52 of the DC link.

For that purpose, one needs a floating voltage source of 12V, namely the transformer 60 shown in FIGS. 1-2, with associated rectifier, etc., and this voltage source provides the voltage for controlling the upper MOSFETs 100, 102 of KARWATH. Further, KARWATH needs an optocoupler 100, 112 to provide voltage separation. This all requires a substantial "hardware" investment in the motors built according to the KARWATH disclosure. KARWATH provides **no suggestion** of the present invention, but rather teaches in a diametrically opposite direction.

ECKARDT (WO 2002-50897, corresponding to USSN 10/464,872) was applied (on page 5 of the Office Action) against claims 3-6, as allegedly teaching an "auxiliary circuit" comparable to that of the present invention, thus supplying an element not found in the KARWATH reference alone.

The Office Action refers to ECKARDT's FIG. 9. This shows a DC link, which is supplied from a 3-phase AC source 18, via a rectifier 20, with power. However, the positive lead of the DC link is not connected to the 3-phase AC net 18, but rather via diode D and capacitor C2 to ground (GND). Diode D provides separation between capacitor C1 and capacitor C2. During operation, capacitor C2 is coupled to a DC voltage supplying power supply 8, which in turn supplies a DC voltage to other components 6. Components 6 control the commutation process and are part of a circuit designated **32** in the WO document and designated **22** in the corresponding US 2004-0 004 404-A1. ECKARDT fails to provide any suggestion as to how using a "floating" control voltage to drive upper MOSFETs could allow motor capacitors to be smaller or more compact. Therefore, ECKARDT does not supply the features which are missing from KARWATH, and entirely fails to render the subject-matter of claims 1-11 or 18-20 obvious. Reconsideration and withdrawal of the section 103 ~~rejection based on~~ KARWATH & ECKARDT is solicited.

CONCLUSION

Main claim 1, as amended, clearly recites an inventive advance with respect to prior art ECMs. The invention solves the problem of fluctuations in DC link voltage, and permits use of much smaller capacitors, thereby facilitating manufacture of compact motors with improved service lifetimes, such as those used in industrial vacuum cleaners and similar products. These motors have the great advantage that they no longer require carbon brushes and thus are almost maintenance-free. This is important in the case of industrial vacuums, since they are often used to pick up liquids. Eliminating the brushes means that, even in the presence of liquids, the risk of short-circuits is much lower.

Allowance of the claims, and passage of the application to issue, are respectfully solicited.

The application, as amended, contains only 1 independent claim. No fee for additional *total* claims is needed, since claims 13-17 were cancelled.

Our check #30153 in the amount of $ 1,020, for a 3-month extension of time, is also enclosed. Charge any deficiency, or credit any overpayment, to Deposit Account 23-0442.

If the Examiner detects any remaining informalities, or wishes to make any suggestions to place the application in condition for allowance, a telephone call to Applicants' counsel is requested.

Respectfully submitted,

Milton Oliver

Milton Oliver, Reg. No. 28,333
WARE, FRESSOLA, VAN DER SLUYS
& ADOLPHSON, LLP
PO BOX 224
MONROE, CT 06468
TEL: 203-261-1234
FAX: 203-261-5676

Att. Docket No. 870-003-162